



Ptolemy operations as part of the Rosetta Mission from Hibernation to the Surface of Comet 67P

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Rosetta is a European Space Agency 'Planetary Cornerstone' mission intended to solve many of the unanswered questions surrounding the formation of the Solar System. Rosetta exited Deep Space Hibernation (DSH) on January 20th 2014, an event that started an exhilarating period of comet approach, mapping and then the eventful landings of Philae upon several locations on the surface of comet 67P/Churyumov-Gerasimenko.

Ptolemy is a miniature chemical analysis laboratory aboard the Philae lander intended to determine the chemical and stable light isotopic composition of material sourced from beneath, on and above the surface of comet 67P. The Primary Science (chemical and stable light isotopic composition) was to be returned during the First Science Sequence (FSS) via Gas Chromatograph Mass Spectrometry of a solid cometary sample undergoing stepped pyrolysis/combustion in an oven of the Sampler, Drill and Distribution system (SD2). In addition, Ptolemy can also passively adsorb coma material onto molecular sieve within one of the SD2 sample ovens for later release and analysis, an operation known as the Comet Atmosphere Sample Experiment (CASE). A third operational mode consists of 'sniff' detections of the current spacecraft environment by directly analysing the inside of the mass spectrometer itself, which is connected to space via a vent pipe. This "Sniff Mode" is a simple, low resource mode that does not require an SD2 oven and was used during the baseline FSS to provide contextual information about the local coma.

'Sniff Mode' has been operated sixteen times since DSH, first at a comet distance of ~5,000,000 km and then twice each at ~15,000, 30, 20 and then 10 km comet centre distances. These first 9 measurements provide useful insight into the spacecraft environment and at the lower heights offer the tantalising possibility of direct comet coma detection.

During the Philae landing a Sniff Mode measurement was undertaken ~9 minutes after the first Philae contact, having rebounded back into near-comet space. The non-nominal landing resulted in the cancellation of the default FSS including the removal of the Ptolemy solid sample stepped pyrolysis/combustion step. There then followed a heroic effort by the Lander and Orbiter ground segments and various instrument teams to recover science, part of which resulted in the opportunity for Ptolemy to conduct a further 6 'Sniff Mode' measurements at Philae's final landing site and, during the final moments prior to Philae losing power, the opportunity to conduct a much-modified CASE measurement.

Initial results from these various operations including the detection of water and organic species and their temporal and spatial variations will be presented and discussed.

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